

Dendrobates tinctorius
(2 White morph variants)

AMERICAN DENDROBATID GROUP

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STATEMENT OF PURPOSE

The purpose of the American Dendrobatid Group (ADG) is to educate enthusiasts and distribute information on all aspects of Dendrobatid husbandry and captive propagation. To develop better communication between Dendrobatid breeders and other frog breeders. The ADG is also interested in the maintenance and propagation of Mantellid frogs, Atelopid toads, and other unusual frogs and toads. This Newsletter appears four times a year at a cost of \$15.00 per calendar year. Back issues are \$3.00 each, or on a yearly basis: 1992 is available for \$5.00; 1993 and 1994 for \$10.00/year, and 1995 for \$12.50, and 1996 for \$15.00.

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AN INTRODUCTION TO LESS FAMILIAR MANTILLAS

Marc Staniszewski

Introduction

The Madagascan Ranidae (typical frog) subfamily Mantellinae consists of two genera. The larger but least familiar is the diverse genus *Mantidactylus* consisting of over 40 species of ground dwelling and scansorial frogs. The small yet infinitely more popular is the beautiful genus *Mantella* which currently consists of 12 definite species, several unconfirmed 'species' and a host of subspecies and geographical forms. These are as follows:-

- Golden Mantella (*Mantella aurantiaca* Mocquard, 1900)
 - Black-eared Mantella (*Mantella* sp.) = *M. 'milotympnum'*?
 - Painted Mantella (*Mantella baroni* Boulenger, 1888)
 - Bernhard's Mantella (*Mantella bernhardi* Vences et al. 1994)
 - Brown Mantella (*Mantella betsileo* Grandidier, 1872)
 - Cowan's Mantella (*Mantella cowanii* Boulenger, 1882)
 - Yellow Mantella (*Mantella crocea* Pintak and Böhme, 1990)
 - Blue Legged Mantella (*Mantella expectata* Busse and Böhme, 1992)
 - Haraldmeier's Mantella (*Mantella haraldmeieri* Busse, 1981)
 - Arboreal Mantella (*Mantella laevigata* Meuthen and Hewitt, 1913)
 - Mahajanga Mantella (*Mantella cowanii nigricans*) - Guibé, 1978)¹
 - Parker's Mantella (*Mantella pulchra* Parker, 1925)
 - Green Mantella (*Mantella viridis* Pintak and Böhme, 1988)
- (¹Recommended to be raised to specific status by Vences)

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Demand for mantellas has increased dramatically over the last few years and this has imposed a serious problem on the already dwindling native populations of these frogs in their natural habitat. Over collection, the introduction of predatory animals, deforestation and human encroachment has resulted in some species declining to the point of extinction. With the cost of an individual mantella still extremely low this has resulted in very

little in the way of concentrated captive breeding projects (unlike in Dendrobatids). *Mantella aurantiaca* is currently a CITES Appendix II species, while *M. bernhardi*, *M. cowanii*, *M. haraldmeieri* and *M. viridis* are being proposed as Appendix I or II species at the CITES convention in Zimbabwe in 1997.

Most of us are familiar with the golden, painted, green and yellow mantellas which are regularly available and requirements for their captive care are fairly well documented. In recent times less familiar species such as Bernhard's, Haraldmeier's, blue-legged, Mahajanga and the undescribed black-eared form of the golden mantella have become available in small quantities and it is for these species that husbandry is discussed.

Taxa

Black-eared Mantella

(*Mantella* sp.)

Occurs in the Fiherenana Valley in central east Madagascar. At just 15 - 18 mm in length this is the smallest species and, although currently ascribed to *Mantella aurantiaca*, it is so different in appearance and behavior that it merits being raised to specific status. The name *Mantella 'milotympanum'* is often bandied about but as yet there is no confirmation that it is a specific mantella. The dorsum is a slightly drab orange (males brighter than females) while the venter is a greenish yellow (orange yellow in *M. aurantiaca*). This species is overall much slimmer than the golden mantella, the eyes are oblong rather than round and the skin is much more granular. Raised veins are apparent on the hind limbs, as its name suggests the eardrum (tympanum) is black as is the nostril region and there is a black line apparent from the eye to the nostril. It has a very nervous disposition, sometimes crepuscular behavior and it is far more reticent than *M. aurantiaca*. Surprisingly males are one of the most vociferous mantellas and will call for hours.

A good set-up for 4 - 8 specimens is a 60 x 40 x 40 cm aquarium (or wooden vivarium with a glass tray) with a natural live sphagnum moss substrate resting on top of peaty compost and offering plenty of hiding places and burrows. Pieces of cork bark rested on top of the moss along with lots of small plants such as snakeskin (*Fittonia* species), bottle ferns and prayer plants (*Maranta*).



Mantella sp. Photo by Marc Staniszewski, 1997

A small water source ideally fed by a trickling waterfall will help maintain humidity. Its temperature requirements are slightly higher than that of other highland species with 70 - 74°F. being preferable. Some sort of misting system may encourage this species to breed. I used a semi-automated misting system (used in horticulture) to get a spawning from this species. The eggs are quite different from the golden mantella possessing a yellowish-brown nucleus which mea-



Mantella expectata Photo by Marc Staniszewski, 1997

ures only 1.5 mm in diameter. The 2 froglets that metamorphosed were incredibly tiny at just 5 mm and troublesome to feed (juvenile aphids and springtails being the most suitable food).

Blue-legged Mantella (*Mantella expectata*)

Discovered on the edges of a brook in the drier regions of southwestern Madagascar as recently as 1993 this species is only 20 - 30 mm long. The colors vary quite considerably but the most prized are those with a bright yellow back and stunning blue flanks and limbs. Such frogs, although not rare, appear less frequently than those with slate-gray or brown limbs and a rather green dorsum. Females tend to be larger, more rotund than males.

In captivity it requires a fairly extensive but shallow body of water (preferably mobile) around which are positioned pebbles and rocks with a scattering of leaves and moss. The vivarium should be misted less frequently than for other species during most of the year. Although males often call continuously, to stimulate these frogs into reproductive action, during late spring to late summer misting should be more protracted and frequent. It seems that in the wild the brief rainfalls of that region is the stimulus and females will then produce 2 - 6 clutches of 35 or more eggs over an 8 - 12 week period.

Unfortunately many of the *M. expectata* that come into the pet trade are in poor condition and often showing signs of scratching disease. This must be treated with a topical application of a suitable antibiotic such as 5% solution Baytril or even a steroidal antibiotic ear or eye drop such as MaxitrolÆ.

Mahajanga mantella

(*Mantella cowanii nigricans*)
This mantella was described as *Mantella cowanii nigricans* in 1978 by Guibé. Further investigation by Vences in 1996 recommends that it should be raised specific status. Attaining 28 mm it is often labeled

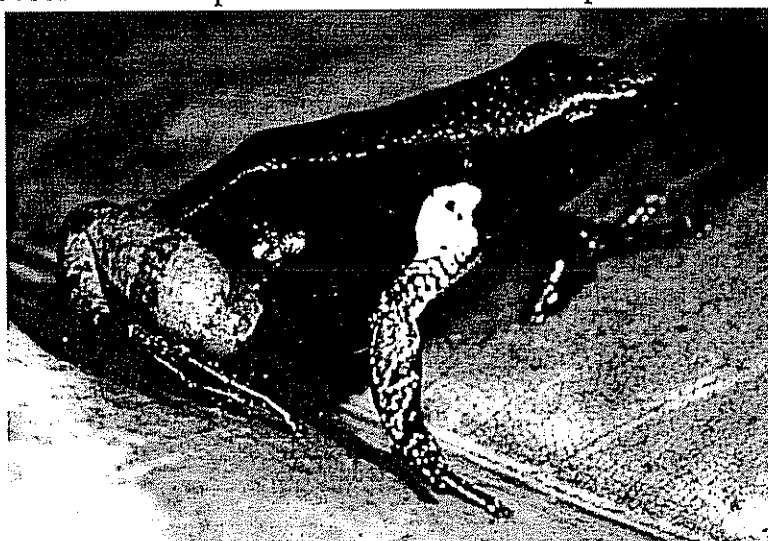


Mantella cowanii nigricans Photo by M. Staniszewski, 1997

incorrectly as *Mantella negristata* or *M. veronique*. Occurring in large numbers in the northern part of Madagascar from Mahajanga Chain to Nosy Be (where it supposedly outnumbers *M. laevis* by 4 : 1 in some areas), it has a green head and upper body with maroon or dark brown lower dorsum and flanks. Its nose is rather pointed and the eyes possess a gold tint to the iris. In captivity it prefers temperatures to about 75°F and the whole vivarium should be gently misted twice a day. The substrate should possess plenty of leaves, pieces of bark and rocks with some mossy areas. Its slightly enlarged toe-pads implies that it also climbs and it can often be seen scurrying up branches and plants in pursuit of insects. A short period of cooler drier temperatures will stimulate this species to breed once normal conditions resume. Other than this little is known on its breeding habits except that the males are very raucous. Quite an easy species which should become a firm vivarium favorite.

Haraldmeier's mantella (*Mantella haraldmeieri*)

A medium-sized species measuring 21 - 29 mm. It was discovered in 1981 in the extreme south-east of the Madagascar and is rarely imported into the hobby probably due to a very localized distribution. Distinguished



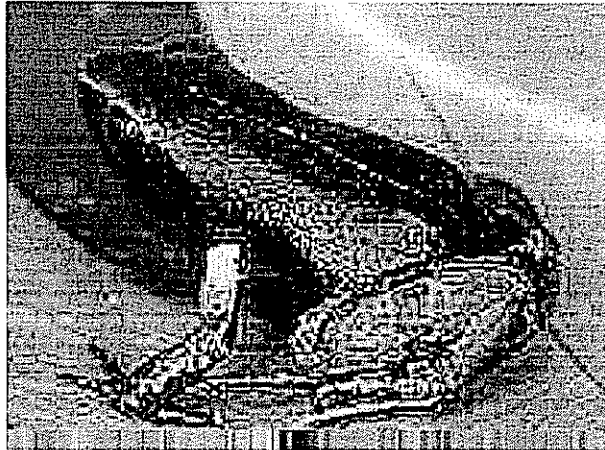
Mantella haraldmeieri. Photo by Dennis Sheridan, 1996

from the very similar *M. pulchra* by the heart-shaped marking on the brownish dorsum although it often tends to be a paler less colorful species. The front limbs also tend to be whitish-green and the hind-limbs a dull orange. In captivity it requires a humid, mossy well planted vivarium with plenty of hiding places and a small water source (preferably fed by trickling water). Quite shy in nature it presents no real difficulties in captivity except that I once had a small colony that initially insisted on feeding on termites. Only with lots of patience was I able to coax them on to small black field crickets (*Gryllus sp.*)

In captivity it has been found to produce relatively large clutches of 60 or more yellowish-white eggs usually from March to July. In the wild it undergoes a semi-aestivation where temperatures fall to the mid 60's and conditions become dry. It is possible that this is the stimulus needed to promote egg production although further investigation is required. The Shedd Aquarium in Chicago has been successful in breeding these mantellas under such conditions although reported high mortality rates of tadpoles and froglets. This species urgently requires some sort of intensive captive breeding program to combat its precarious wild state.

Bernhard's mantella (*Mantella bernhardi*)

One of the smallest mantellas it reaches a maximum length of only 21 mm (smaller in males). I have to confess that the behavior of this very rare species in captivity has made it a great favorite of mine. All the specimens I have acquired have been in extremely poor condition yet after intensive



Mantella bernhardi. Photo by M. Staniszewski, 1997

care they have responded well. The male is by far the most boisterous of the mantellas and possesses a good vocal sac which he is proud to exhibit given any opportunity. It even attempts to mate with a stray finger or pair of forceps! The general color is black apart from the inside of the limbs which are a dazzling yellow. The throat of the male possesses a white horseshoe-shape marking which is wider and extends further than in the female. The skin is known to be quite toxic hence it's boldness. It demands warm, humid conditions and prefers fruit flies or aphids to most other foods. I have found that this species deteriorates when

maintained in enclosed spaces. So unlike most other species it will not survive long being cooped up in a margarine tub or similar container. Given optimum temperatures (70 - 76°F.) and humidity in the 80 - 90% range egg laying can become a regular occurrence, with 12 - 25 small whitish eggs being deposited in mossy depressions or holes drilled into damp bogwood. Due to habitat clearance this is the most seriously threatened mantella and urgent steps are required to establish captive breeding pools. Some hobbyists are experiencing good results so far.

BEGINNER'S COLUMN

Vivarium landscaping: Ideas gleaned from FrogNet

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One of the joys in frog keeping is designing your frogs living quarters. This can range from simple, utilitarian terrariums to elaborate self-contained ecosystems. The main consideration is the purpose of the tank: is it to be used to showcase the frogs, perhaps in a living room where guests can marvel at the beauty of your little rainforest; or is it to provide the most ideal breeding conditions for the frogs; or even both?

When most of us think about vivaria, the first thing that comes to mind is a tank full of live, growing plants to complement our frogs. Of course, plastic plants are an option, they don't require any special care, they remain the same size, are easily sterilized and the frogs may not be able to tell them apart from real plants. There are even quite realistic-looking artificial plants available. Plastic plants can be very useful in tanks where a somewhat naturalistic look is desired, but where the live plants don't do well, such as in a low light set-up; or where regular total cleaning and sterilization is required, as in a quarantine tank. Many frogs will live quite happily in a totally artificial environment, but for most of us the challenge and satisfaction of maintaining a vivarium involve the use of live plants.

Live plants provide benefits that artificial plants do not: they increase the humidity level and help provide oxygen, absorb nitrogenous waste. They are also good indicators of the vivarium conditions - if the plants are dying, then something is wrong! What you seek is a tank which provides ideal living conditions for both the frogs and the plants. Fortunately, the conditions that many of the tropical plants we use grow in is the same type of environment we need to provide for the frogs.

Drainage

Drainage, to prevent stagnant water from accumulating in the land portion of the vivarium, is one of the first things to consider before starting to build up the landscape. As it was discussed in an earlier part of this series, drainage can be provided by many different means. It can be a built-in feature of the tank in the form of a drain hole drilled through the bottom of the tank. If the tank is not pre-drilled when first obtained, exercise some caution in doing it yourself. Acrylic tanks are easily drilled, but watch out for tempered glass bottoms on some of the larger all-glass tanks. Tempered glass can be very difficult if not impossible to drill successfully without damaging the entire bottom of the tank. If drain holes are used, the holes can be fitted with bulkhead fittings to allow the attachment of pipes leading to a sump or household drain. A sump under the tank will allow the water to be re-circulated if desired, and heating and filtration can be carried out in it as well, out of sight yet accessible.

An alternative to having drainage holes would be a drainage layer under the soil. This can be done by using a layer of gravel or clay hydroponic granules. Another way would be to use plastic egg-crate lighting diffuser, raised from the tank floor by short sections of PVC pipe tied in intervals underneath it, then covered by fiberglass screen or landscape fabric. This allows the water to drain away from the planting mix and air to penetrate, preventing plants unaccustomed to boggy conditions from rotting.

Substrates

There are several types of substrates that can be used as the vivarium floor; some of which were discussed in a previous article. Many plants are remarkably adaptable, and depending on the species, may thrive in varying soil conditions, but generally a well draining soil is best. A number of plants used in dart frog vivaria are actually epiphytes, and in the humid environment can be grown on branches or slabs of cork bark or tree fern root situated on the back and sides of the terrarium. In this case, no soil mix is used, and the roots of the plants may be simply wrapped in moss and attached to substrate using fishing line, plastic coated wire, nylon cable ties, or staples. The plants will eventually root to the substrate, and once they are firmly attached the ties or wire can be removed.

One important factor in landscaped vivaria is the size of the tank. The larger the tank, the easier it is to landscape. This is because under the right conditions, plants grow especially well in vivaria and small tanks limit the size and number of plants which can be used. Small tanks are best kept simple, with perhaps only one larger plant or a group of one kind of small plant which is used as the focal point in the terrarium. Larger tanks allow the vivarium landscaper more leeway, and provide opportunities for different growing niches for a wider selection of plants.

Maintenance

The amount of maintenance required should be considered as well. A simple landscape can be very easy to maintain, needing only a few minutes a week to wipe everything down to keep things clean. It also makes the frogs easy to locate if they need to be captured and moved. This may be important if the frogs have to be kept under strictly controlled conditions and kept under observation for quarantine or scientific study. Lush growths need maintenance; pruning is often necessary to keep the plants in check, especially in smaller tanks. Without regular upkeep, a vivarium can quickly become a tangled jungle, which may limit its appeal as a display. On the other hand, lush overgrowth provides lots of hiding places for frogs and may sustain populations of food insects like springtails, at least until the frogs eat them all. The frogs may be hard to find but they love the cover and may breed better because of the added feeling of security.

Temperature and humidity

The proper temperature can be maintained for both frogs and plants using different methods. The simplest way, especially if many vivaria require the same temperature range, is to maintain the room temperature at the desired levels. If you only have a small number of tanks then individual tanks may be heated using under-tank heating pads or aquarium heaters kept in a water portion of the tank. Note that aquarium heaters must always be kept submerged in water, or damage to the heater and tank may result because of overheating. Heat lamps are used by some, but these have the tendency to dry out the tank unless some method of constantly maintaining the moisture level is provided. Some frogs will bask under the lamp, but be aware that plants sitting under the lamp may be damaged by excessive heat.

High humidity can be maintained simply by diligent spraying with a hand-held mister or by using automated misting systems. A shallow dish can provide a small pond for the frogs as well. A more ambitious design would be to section off a part of the tank with a low wall of glass or plastic to provide an aquatic area. Since dart frogs are not aquatic as adults, make sure that the ponds are constructed in such a way as to allow the frogs to climb out of the water easily to prevent them from drowning. Water depths up to four inches, deep enough to maintain small fish, have been used with success as long as caution in design is used. Sloping gravel beaches, rocks and driftwood provide egress for the frogs from the water area. If a waterfall is desired, small aquarium pumps may be used, but make sure that the pumps are easily accessible for cleaning. One way to hide a pump is to enclose it in a perforated plastic food container with a lid, hidden under a slab of bark or partially buried under gravel in the water portion of the vivarium. A tube can be attached to the outlet of the pump and run to where the waterfall is to be located. Make sure that the intake of the pump is covered with a screen or grill of some sort to prevent objects (especially frogs!) from being sucked in along with the water. The screen will need occasional cleaning to keep the water flow constant.

Lighting

Lighting presents a dilemma for dart frog keepers; some frogs are shy and will remain hidden if the tank is brightly lit, yet the plants in the tank require bright lights to do their best. The solution may be as simple as putting in enough plants to provide shaded areas in the vivarium where the frogs can feel secure enough to go about their activities in plain view. Incandescent light fixtures are commonly sold for vivarium use, but even if they are the cheapest type of lighting system they are relatively inefficient and use more electricity than fluorescent fixtures do. Incandescent light bulbs often provide poor color rendition and give relatively less light per watt than other types of light. Often, they can't provide enough light to grow most plants. In addition they generate quite a bit of heat which may damage plants and dry out the vivarium, if not directly harm the frogs. They are best used only to provide basking spots for vivarium inhabitants, if that is needed. And then extra ventilation must be provided to prevent overheating.

Fluorescent lighting provides much better color rendition, provides more light per watt and are cheaper to run even if the fixtures may initially cost more than incandescent systems. Shop lights, which are sold as complete systems in many hardware stores, can easily be adapted as vivarium lights. Fluorescent tubes emit enough light to allow most vivarium plants to grow successfully, especially if the plants are positioned as close to the lights as possible. Since fluorescent lights do not produce as much heat as incandescent lights, there is less danger of damaging the plants even if they are directly above the foliage. Metal halide lights provide better color rendition, depending on the type

of bulb, and they emit lots of light. They are so powerful that they can illuminate large, deep tanks brightly enough to allow even many orchids to bloom, but like incandescent bulbs they can generate a lot of heat. They are best used with very large tanks that have sufficient ventilation. Precautions must be taken to ensure that water from a misting never reaches the lights.

Plants

The choice of plants that are suitable for vivarium landscaping is huge, limited only by the space available inside the tank, the conditions that you are able to maintain, and what you can find and afford. Most frog hobbyists go for the "tropical rainforest" look, as opposed to true approximations of natural jungle. This means that the plants used may not necessarily come from the same habitats as the frogs, and the "look" of the vivarium may conform more to what we perceive as attractive, rather than what it really looks like in the frogs habitat. Moss, for example, is often used as a ground cover in vivaria, even though most tropical rainforest floors are mostly mud and fallen leaves. It certainly provides a visually appealing floor, and it helps keep the vivarium clean as well by minimizing the amount of exposed dirt that the frogs can track around. Not all types of moss can survive under vivarium conditions; the ones that do mostly come from tropical or subtropical habitats and are able to thrive in the same conditions of moist warmth that the frogs require. Such mosses often require surprisingly large amounts of light to survive, and will eventually die off if shaded by larger plants. They are best used in open areas of the vivarium, away from large, aggressively growing plants that might rob them the light they need to survive. Several terrarium supply companies sell tropical mosses.

Ferns are another common addition to the vivarium. Often, ferns will appear spontaneously from spores brought in with the moss or leaf litter used in your vivarium. The humid conditions are perfect for the spores to establish themselves. Several types of ferns are epiphytic, and can grow on branches or bark, enhancing the tropical look of the vivarium. *Davallia* and *Polypodium* have furry-looking creeping rhizomes that cling to the surface of their substrate, *Asplenium nidus*, the bird's nest fern, clings to the substrate with a spongy root mass that is an excellent substrate for other epiphytic plants.

Plants of the aroid family - pothos, anthuriums, and aglaonemas, are often available as small potted plants and easily adapt to vivarium life. Members of the Gesneriad family - African violets, *Columnnea* and *Episcia* adapt well too terrarium conditions, but require good drainage to prevent rooting. Some of these plants, especially anthuriums and columnneas, grow as epiphytes in the wild, and can do so in the vivarium also.

Bromeliads are practically essential to reproduce the dart frog's habitat. Plants from the genera *Neoregelia*, *Tillandsia*, *Vriesea*, and *Guzmania* are most commonly used. Choose small growing species that do not have spines in the leaves. The central leaf cups of most species should be kept filled with water, and they should be flushed out occasionally to prevent the plants from rotting from the center. Bromeliads with gray, scaly or fuzzy leaves are generally desert species and should only be used if you can provide higher light levels, excellent air circulation and a dry period between waterings.

Orchids can provide that classy "tropical look" to a vivarium with their exotic blooms, but they require good air circulation and careful watering. Species that have low light requirements are best for your vivaria: jewel orchids, lady slippers, and *Phalaenopsis* are generally good species. These plants, both terrestrial and epiphytic, require moist conditions at the roots but their leaves should not be kept wet or they will rot. *Phalaenopsis* and some other genera also require a nighttime drop in

temperature to be able to set buds and bloom. With a few extra precautions, orchids are an excellent touch for a tropical vivarium.

There are many other plants that can be included in vivaria: *Dracaenas*, *Plectranthus*, *Begonia*, *Tradescantia* and *Epipremnum* and/or Pothos. With most of them, if the frogs are happy, the plants will be happy also. Just give them enough light and moisture, and they're no trouble at all. When arranging plants in the vivarium, keep in mind that you are primarily providing living spaces for the frogs. The plants provide microhabitats that allow the frogs to choose where they are most comfortable. They also serve as visual barriers to help the frogs establish territories in the relatively limited space of a vivarium. Plants like bromeliads also provide possible breeding sites, just as they do in nature. Large-leafed plants provide shaded areas under which frogs can hide from bright lights. If the plants lower leaves are trimmed away, the frogs can take shelter under the plants and still remain visible. Many frogs also choose large smooth leaves as egg-laying sites, which is another good reason to include them in a dart frog vivarium. Because plants with large leaves are visually "heavy," they are easily used as the focal points of the vivarium, and plants with smaller or lacy leaves like ferns can be used as "garnish" to provide contrast and accents.

Considerations and Conclusions

It is important to remember that plants are living things that will grow and change with time. Leave room around them, and anticipate what they will look like in a few months or years. Be aware that the leaves on many plants will be bent back by the sides of the tank, or if the plant reaches the top of the terrarium it can be dried out by the lights. Another consideration is how the plants will compete with each other, with the faster growers shading off and killing the slower. In many cases appropriate trimming on the faster growing plant can resolve this problem.

Terrestrial plants may be kept in pots which are then buried in the vivarium substrate. This makes it easier to move or replace the plants if they get too big or die, but be aware that many plants will send roots out of the pots drain holes and root themselves into the substrate, so if the plants are to remain moveable their pots must periodically be lifted out of the substrate and any protruding roots be trimmed back. Because the soil in the pots will become exhausted of nutrients, the plants will eventually have to be repotting in new mix. Because potted plants live in their individual pockets of soil, be sure that each pot regularly gets the proper amount of water. Terrestrial plants may also be planted directly in substrate where their roots will benefit from having the freedom to seek nutrients and moisture as they see fit. Many plants will adapt to moist gravel, growing hydroponically and absorbing nutrients released from frogs waste. The drawback here is that once the plants are established, they can be difficult to move because of their extensive root systems.

Epiphytic plants can be positioned in several manners as well. If they were acquired as potted plants or attached to cork slabs, then they can be wedged in forks of branches or crevices in bark, or they can be tied on to branches or wall coverings. This allows them to be removed if needed, or if blooming plants are desired for a display. For a more natural effect, the plants can be removed from the pots and their root balls wrapped in moss, after which they are attached to their perches in the same manner as the potted plants, or more permanently with fishing line or nylon cable ties. This allows them to eventually root to the substrate and secure their hold to it. Some epiphytes like tillandsias can actually be glued on to their perches, and prefer to be without any moss around the roots, it is advisable to position some kinds upside-down to prevent excessive moisture from collecting on the leaves and causing rot. Silicon aquarium glue can be used if it is done before any animals are

introduced to the vivarium, since the fumes that the glue releases during curing can harm them. Hot glue can be used as well, but only if there are enough leaves on the plant as heat can damage growing points and should not be applied directly on the base of the roots. One thing to remember about arranging epiphytes on attractive pieces of driftwood is to leave areas of bare wood, and not to completely cover the branches. Doing so would hide the beauty of a piece of natural sculpture. Make sure that the form of the wood remains visible; and again, do not forget that the plants will grow, so leave allowances for that.

Watering the plants can be accomplished in several ways. Often, the act of providing humidity for the frogs is enough to water the plants and vice versa yet another reason to use live plants. Hand spraying is the commonest way to do this, one just has to remember to check the vivarium daily and spray whenever necessary. The advantage of hand spraying is that watering can be adjusted depending on how moist different areas of the vivarium need to be and how fast they dry out. A clump of ferns that needs more attention on a particularly dry day can be given a few extra spritzes of water, while an orchid that needs to dry out a bit more can be avoided for a few more days. Automatic misters or sprayers are the answer for folks who are unable to tend to their vivaria constantly, or have so many vivaria that there is not enough time to do so. Once the placements of the water outlets are determined and the ideal timing is calculated, automatic sprayers save the keeper a lot of time and effort.

Perhaps the most often ignored requirement for vivaria is air circulation. Proper air circulation helps prevent fungus problems, and allows plants that need to dry out a bit to do so. It also helps prevent the front pane of the vivarium from fogging up and limiting visibility. A small computer muffin fan can be used to blow air into the vivarium. Avoid using it to suck air OUT of the vivarium because the moisture may cause the fan to rust. If screen tops are partially covered with plastic to retain humidity, try leaving the space above the front pane uncovered to prevent excess moisture from collecting in that area. Having a fan blow across the inside of the front pane will also help prevent fogging. Remember that not all types of both frogs and plants require the same degree of humidity and temperature, so select your vivarium's inhabitants wisely, and adjust the ventilation accordingly.

In conclusion keep the frogs' safety and comfort in mind when landscaping a vivarium. Avoid using plants or materials that have been exposed to harmful chemicals, like pesticides, fungicides, and wood preservatives. Also avoid materials that can hurt or trap the frogs, like plants with spines. A well landscaped vivarium not only provides a wonderful environment for your frogs, it also allows non-frog lovers to appreciate the beauty of your hobby, and may even make a few converts.

ANNOUNCEMENTS

Diseased frogs from Panama

Jack Frenkel submitted the following: "The New York Times of Tuesday, September 16, 1997, pp. B6 and B11 contain an article about a frog die-off observed at Fortuna in northern Panama, where *D. arboreus* comes from. This was circumstantially linked to a die off in Costa Rica. A protozoan was tentatively identified in the skin of the Fortuna frogs, which was said to resemble the cause of an oyster disease in Chesapeake Bay. The latter is due to *Perkinsus* [see for example *Parasitology*, 114: 339-349, 1997 (This is different from *Pfiesteria*, also in the news recently, which acts by means of a/several toxins of fish and probably humans) see for example *J. Toxicology and Environmental Health*, 46: 501-522, 1995]. I have no idea whether the Panama organism would infect and kill *Dendrobatids*. However caution would be indicated." Jack further suggests that until the details are

cleared it is ill advised to obtain wild caught Costa Rican or Panamanian frogs collected within the last year.

Frog thief at the Atlanta Botanical Gardens

The Atlanta Botanical Garden is missing at least 22 Dendrobatids that were taken from our tanks sometime between 3 PM Thursday October 2 and 7 AM on Friday October 3. These were mostly our adult breeders and include the following:

- 2.2 *Phyllobates terribilis* (green morph)
- 1.1 *P. bicolor*
- 1 *P. vittatus* (juvenile)
- 2 *Epipedobates trivittatus* (juveniles)
- 1.1 *E. tricolor* (green and red morph)
- 1.1 *Dendrobates azureus* (adults, NAIB stock)
- 0.0.1 *D. azureus* (juv)
- 2.2 *D. auratus* (typical morph)
- 1.1 *D. auratus* (blue)
- 1.1 *D. tinctorius* (large yellow Wattley morph)

If you are approached by an individual (possibly from the Atlanta area) trying to trade or sell some combination of the above animals, I would appreciate a call (404-876-5859 X255) or an e-mail (kikker@earthlink.net) as soon as possible.

We have a suspect. On Thursday afternoon, we had a young man visiting the conservatory who expressed interest in Dendrobatids. I spoke with him briefly and he asked me specifically about *P. terribilis*. I showed him the *P. terribilis* we had in the back up tanks in the greenhouse, as we don't have them on public display yet. After a 10 minute conversation, I escorted him back to the conservatory and thought nothing more of it. On Friday morning, all the frogs from the back up area in the greenhouse were missing along with nearly all the frogs from one of our three public displays. Plants were also taken and we suspect he spent some time in the conservatory collecting *D. histrionicus*. Normally it is possible to see 20 or so, but on Friday we could find only 3 *D. histrionicus* in the conservatory! By the way, we have a description of this guy. Young white male age 19-22; 6 feet tall with blond hair cut close on the sides, long on top, pulled to short ponytail. Goes by the name "Josh" and made a comment about moving to Chicago soon. Seemed like a nice enough guy, but looks are deceiving I guess. This is a devastating blow to our collection here and also to my psyche to be honest. I have never met a frog keeper who didn't attempt to help out fellow keepers by showing their set ups, answering questions about care, etc. To be rewarded for generosity with this saddens me. Anyway, thanks for all the phone calls offering frogs in the future and the show of support I have had already from frog friends. Please keep me posted if you see anything suspicious!

Many thanks!

Ron Gagliardo

The Dorothy C. Fuqua Conservatory

Atlanta Botanical Garden

NEW LITERATURE


DENDROBATIDS

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ADS:

Rates for business card adds are \$10 per issue or \$50 per year. If you are interested please contact the Newsletter editor.

REPTILE SPECIALITIES (John Uhern, 7473 Foothill, Tujunga, CA 91042 Tel. (818) 352-1796; Fax (818) 353-7381) has various captive breed Dendrobatids and wild imported *Mantella* for sale. Write or call for information.



Reptile Specialties

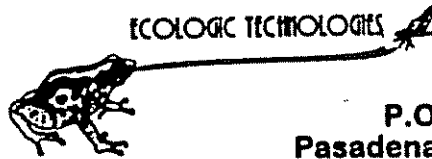
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For Sale

Ads for sale of frogs, or requests or offering of breeding loans, etc. are free to members and will run for two issues only, unless the Newsletter editor is notified.

Two pair of adult wild caught *Dendrobates tinctorius* 'powder blue' for sale at \$250/pair. I have had these frogs for about 6-8 months, they are very healthy and I will consider any reasonable trade or offers. Odo Nicholas Dietel and Shelly Ann Dietel (102 North Berger Parkway #L1, Fon Du Lac, WI 54935 Tel: (414) 921-1223, e mail: dartboy@internetwis.com

Male *Dendrobates pumilio* and *Phyllobates bicolor* tadpoles to trade for female *D. pumilio*, male *D. lehmanni*, and/or female *D. histrionicus* 'Bullseye' (would consider offering 0.0.1 cb *D. histrionicus* in trade). Ron Gagliardo, 1180 Oldfield Rd., Decatur, GA 30030 Tel.: (404) 876-5859 x 255 (Atlanta Botanical Gardens), e-mail: kikker@earthlink.net.

Dendrobates tinctorius 'cobalt,' 'giant orange,' and 'white,' and some *Dendrobates azureus*. Market prices. Ted R. Kahn (P. O. Box 1375, Sterling, VA 20164-1375. Tel.: (703) 242-4543.

Froglets:

<i>Dendrobates auratus</i> 'Costa Rica'	\$25 ea.	Jeff McClure 1331 Longfellow Dr. Clarksville, IN 47129-2023 (812) 944-5859
<i>Dendrobates leucomelas</i> 'orange' & 'yellow' tadpoles	\$40 to \$50 ea.	
<i>Dendrobates auratus</i> 'Costa Rica'	\$20 ea.	
<i>Dendrobates leucomelas</i>	\$20 ea (buy 2, get one free)	

<i>Dendrobates azureus</i>	\$125 ea.	Ryan Michaels 616 Mia Ct. Danville, CA 94526 (510) 743-0777
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<i>Mantella aurantiaca</i> c.b.	\$20 ea.	Jennie Munger 75 Sunrise Hollister, CA 95023 (408) 637-0481
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<i>Dendrobates tinctorius</i> 'pallid'	\$50 ea.	Patrick Nabors (309) 622-2609
<i>Dendrobates tinctorius</i> 'powder blue'	\$65 ea.	
<i>Dendrobates tinctorius</i> 'yellow back'	\$55 ea.	

<i>Dendrobates azureus</i>	\$100 ea.	Ken Naugher 6229 Hickory Hill Ct. Montgomery, AL 36117-4817 (334) 279-8568
<i>Dendrobates leucomelas</i>	\$25 ea.	

<i>Dendrobates auratus</i> 'Panamanian, 70% black'	\$35 ea.	Charles L. Powell, II 2932 Sunburst Dr. San Jose, CA 95111-2264 (408) 363-0926 powell2@Ave.net
<i>Dendrobates ventrimaculatus</i> 'Peru, orange' Tadpoles	\$50 ea.	
<i>Dendrobates auratus</i> 'Panamanian, 70% black'	\$25 ea.	
<i>Dendrobates ventrimaculatus</i> 'Peru, orange'	\$40 ea.	

Dendrobates azureus - tadpoles \$80 ea.
 froglets \$100 ea.
Dendrobates tinctorius 'giant yellow' (new morph)
 tadpoles \$80 ea.
 froglets \$100 ea.

Mark Pulawski
 4191 Weathered Oaks Ln.
 Indian Springs, OH 45011
 (513) 896-5531

Dendrobates auratus 'blue' \$75 ea.
Dendrobates azureus (F2, unrelated Wattley blood) \$110 ea.
Dendrobates leucomelas (3 blood lines) \$50 ea.
Dendrobates tinctorius 'cobalt' (F1, Surinam) \$65 ea.
Dendrobates tinctorius 'giant orange' \$125 ea.
Dendrobates tinctorius 'powder blue' \$75 ea.
Dendrobates tinctorius 'yellow back' (F1) \$75 ea.

Greg Sihler
 Arizona Dendrobate Ranch
 P. O. Box 26585-6528
 Tempe, AZ 85285-6528
 (602) 755-0217
 Adicus@primenet.com
<http://www.primenet.com/~adicus/>

Tadpoles
Dendrobates auratus 'blue' \$60 ea.
Dendrobates azureus (F2, unrelated Wattley blood) \$90 ea.
Dendrobates leucomelas (3 blood lines) \$40 ea.
Dendrobates tinctorius 'cobalt' (F1, Surinam) \$55 ea.
Dendrobates tinctorius 'powder blue' \$60 ea.
Dendrobates tinctorius 'yellow back' (F1) \$60 ea.

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Dendrobates histrionicus other than "Valley" morph
Dendrobates pumilio well acimated wc or cb

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 Linwood, NJ 08221
 (609) 653-4325
 AJ3313@aol.com

Dendrobates tinctorius 'giant yellow back' - adult male
 (I have an extra female to trade if necessary)

Charles L. Powell, II
 2932 Sunburst Dr.
 San Jose, CA 95111-2264
 (408) 363-0926
 powell2@Ave.net

Dendrobates fantasticus, *D. histrionicus* (orange netted from Ecuador; female), *D. imitator* 'red head', any *D. pumilio*, established breeding pair of *D. tinctorius* 'Oyapok', *D. variabilis*, *Phyllobates bicolor* (male), *P. terribilis* (yellow or orange). Greg Sihler (Arizona Dendrobate Ranch, P. O. Box 26585-6528, Tempe, AZ 85285-6528 Tel.: (602) 755-0217; E-mail: Adicus@primenet. Web-page: <http://www.primenet.com/~adicus/>

Societies

AMERICAN FEDERATION OF HERPETOCULTURISTS. A non-profit national membership organization of herpetoculturists, veterinarians, academicians, and zoo personnel involved in the captive husbandry and propagation of amphibians and reptiles. Membership includes the highly acclaimed Vivarium magazine, dedicated to the dissemination of information on herpetocultural accomplishments, herpetological medicine, breeding and maintenance, field studies and adventures, enclosure design and much more. Membership in the AFH is \$28.00 U.S. and \$53.00 Canadian and all other foreign countries. Contact: AFH, P. O. Box 300067, Escondido, CA 92030-0067. Tel.: (619) 747-4948; Fax (619) 747-5224.

INTERNATIONAL HYLID SOCIETY: A non-profit organization dedicated to treefrogs enthusiasts worldwide. "The Bulletin of the International Hylid Society" will be published quarterly. Membership is \$15/calendar year. For information or membership contact: William Brown, 2607 Thomas Road, Valparaiso, IN 46383 USA. Tel.: (410) 737-8013; e-mail: hylid@mindspring.com.

INverteEBraTA: Is a wonderful, funny, bi-monthly, bug-husbandry magazine, which I can highly recommend. It covers the husbandry of any sorts of bugs a person might want to keep (and some you don't want to keep), either as pets, or as food for other animals. It also discusses the politics affecting the keeping of invertebrates, contains a wide variety of contributions, and is wonderfully illustrated. Subscription is \$25/year made and mailed to Rino Mascariño, P. O. Box 20721, Los Angeles, CA 90006. Tel.: (213) 227-6566. E-mail: mascarino@earthlink.net.

THE UNITED EUROPEAN DENDROBATE RESEARCH SOCIETY. We publish a quarterly colour journal. Membership within Europe is £10.00 and elsewhere £16.00. For more information contact: Tony Packer, 29 Tiber Gardens, Islington, London, N1 OXE, England. Telephone: 0171 833 0260, Fax: 0171 833 9351, email: Uedrs@btinternet.com

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